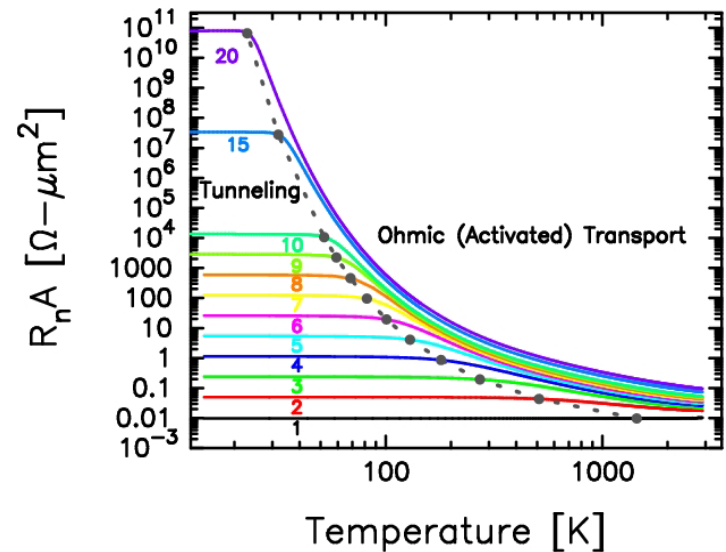
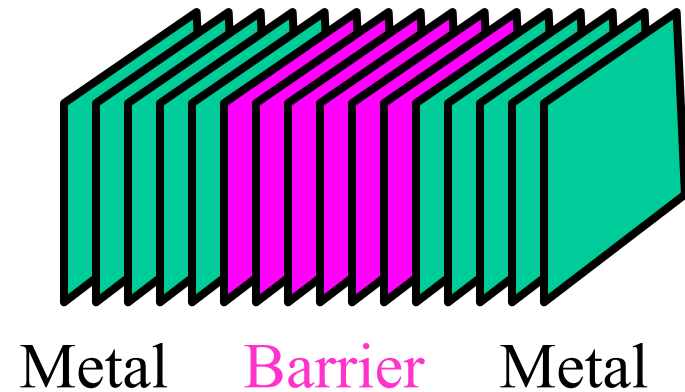


Crossover from tunneling to Ohmic transport in nanostructures

PI's: J. K. Freericks (Georgetown), A. Y. Liu (Georgetown), and B. A. Jones (IBM)

Nanotechnology interdisciplinary research team DMR-0210717

We model an electronics device constructed from a sandwich of metal-barrier-metal with the barrier being an insulator tuned close to **the metal-insulator transition**. By changing the thickness of the barrier, or the operating temperature of the device, we observe a change in character of the transport from **quantum dominated conduction to classical (thermally activated) conduction**. This crossover is governed by an energy scale extracted from the resistance of the junction and the bulk properties of the barrier (a generalized Einstein relation). Our diagnostic can be employed to estimate the maximal operating temperature for tunneling electronics, like those used in magnetic tunnel junctions for MRAM applications.



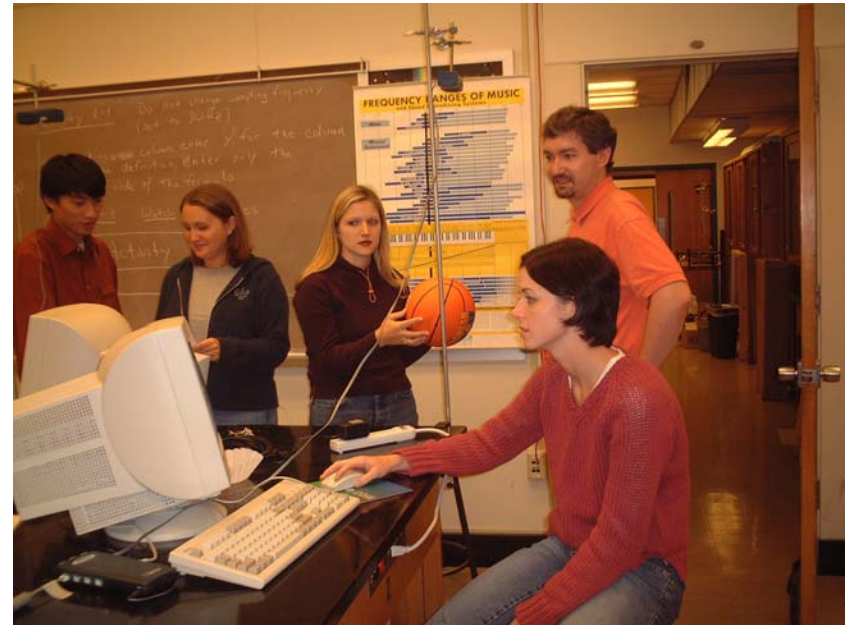
Education and outreach

PI's: J. K. Freericks (Georgetown), A. Y. Liu (Georgetown), and B. A. Jones (IBM)

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The Georgetown University Department of Physics recently started the **Industrial Leadership in Physics** program, designed to train Ph.D. physicists to work in industry. One cornerstone of the program is the requirement of a **year-long apprenticeship in industry**. Ling Chen (far left in the photo) is finishing his apprenticeship at **IBM's Almaden Research Center** under the mentorship of Barbara Jones. His work is currently focused on examining current-induced magnetization reversal in nanopillars.

We also teach a materials science course to nonscientists called the **Quantum World Around Us**. We are initiating an assessment case study to measure the **long-term learning** that takes place in the class. This work will be conducted with undergraduate student researchers.



*Entering class for the Industrial Leadership in Physics program during an initial group orientation featured in **NatureJobs**, Oct. 2001. Ling Chen is on the far left and the PI is on the right.*